

Water Management Plan

United States Environmental Protection Agency
Region 4
Science and Ecosystem Support Division

980 College Station Road
Athens, GA 30605



12 July 2006

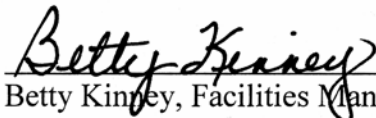
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
SCIENCE AND ECOSYSTEM SUPPORT DIVISION
SCIENCE AND ECOSYSTEM TECHNOLOGY CENTER

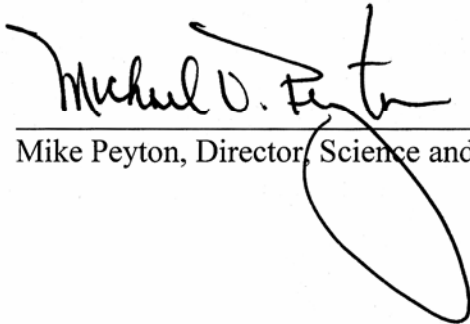
WATER MANAGEMENT PLAN

Approved by:


Betty Kinney, Facilities Manager

8/15/06

Date


Mike Peyton, Director, Science and Ecosystem Support Division

8/15/06

Date

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1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility-specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13123, Greening the Government Through Efficient Energy Management.

This Water Management Plan has been established to document and promote the efficient use of water at the EPA Region 4, Science and Ecosystem Support Division (SESD) facility in Athens, Georgia. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines under Executive Order 13123.

2.0 FACILITY DESCRIPTION

SESD operates a Science and Ecosystem Technology Center at a laboratory facility located on a 12-acre parcel in Athens, Georgia. SESD is the primary provider of scientific and technical expertise and environmental data for the EPA Region 4 program offices in Atlanta, Georgia. SESD's principal field components are the Ecological Assessment Branch and the Enforcement and Investigations Branch. Within these branches, field studies, investigations, and training activities related to human health and environmental issues are implemented. The Analytical Support Branch and Quality Assurance Section, in partnership with SESD's field components, produce quality analytical data necessary to make environmental decisions. Laboratory activities consist primarily of environmental sample analysis, bench scale ecological assessments, and supporting sample storage and preparation functions.

SESD activities are housed in a single story laboratory building constructed in 1996. The facility is owned and managed by Colliers Keenen, and leased to EPA through GSA under a 20-year lease that runs until 2016. The laboratory building contains 66,201 square feet of conditioned space, configured for a mixed use of office and laboratory activities.

3.0 FACILITY WATER MANAGEMENT GOALS

The resource conservation goals of SESD are achieved through the implementation of an Environmental Management System (EMS). The SESD EMS policy statement, as well as objectives and targets related to water consumption, are provided below.

Environmental Management System Policy

It is the policy of the Environmental Protection Agency, Science and Ecosystem Technology Center, Science and Ecosystem Support Division to continually improve our environmental management practices and procedures through defining, developing, implementing, training and reviewing processes to meet our environmental obligations. An effective environmental management system is built on enhancing our organization's practice of environmental compliance and strong preventive measures to promote a safe and healthy environment.

Our EMS will be designed to:

- Meet or exceed all applicable environmental legal requirements;
- Continuously improve environmental performance and regulatory compliance and non-regulatory compliance;
- Employ source reduction, chemical inventory usage, and hazardous waste reduction;
- Enhance the recycling program;
- Affirm our commitment to the pollution prevention program;
- Protect the health and safety of all employees;
- Involve all employees in the continual improvement process; and
- Focus on environmentally conscious landscaping that will safeguard and protect the natural environment.

EMS Water Management Objectives and Targets

SESD has established the reduction of water consumption in laboratories as an objective under the EMS. As specific targets, SESD will eliminate unnecessary steps when doing sample preps and analyses, will determine best practices for general sample preps and analyses, and reduce wash/rinse dishwashing cycle times without jeopardizing safety. Under the EMS program, SESD will also focus on increasing employee awareness in reporting water leaks and turning faucets completely off.

4.0 UTILITY INFORMATION

Contact Information

Potable water supply and sewer service are provided by:

Athens-Clarke County
Water Business Office
596 Prince Avenue
P.O. Box 1948
Athens, Georgia 30603

706-613-3500

Water Rate Schedule

SESD is billed monthly for water use associated with two meters, one for building water service and one for irrigation service.

For water service, the laboratory pays a monthly base charge of \$5.88 and a unit charge of \$1.82 per 100 cubic feet (\$2.43 per 1,000 gallons). The laboratory also pays monthly fixed charges of \$15.00 for an eight-inch fire sprinkler system and \$17.59 for meter management services.

For irrigation service, the laboratory pays a monthly base charge of \$5.88, a unit charge of \$1.82 per 100 cubic feet (\$2.43 per 1,000 gallons), and \$1.00 for meter management services. Note that the irrigation meter had been malfunctioning for some time; the irrigation water consumption was not being recorded and billed until Athens-Clarke County repaired the meter in February 2006.

Sewer Rate Schedule

The utility also assesses monthly consumption charges for sewer service, which include a base charge of \$5.88 and a unit charge of \$1.62 per 100 cubic feet (\$2.17 per 1,000 gallons). Sewer charges do not apply to the irrigation meter.

Water and sewer fees described above became effective in October, 2005.

Payment Office

Research Triangle Park Finance Center (RTP-FC)
Kim Poteat, 919-541-1468

(Pouch and Regular Mail)
Environmental Protection Agency
Mail Code - D143-02
Research Triangle Park, NC 27711

(FEDEX)
Environmental Protection Agency
Mail Code - D143-02
4930 Page Road
Research Triangle Park, NC 27711

The fax number for RTP-FC is: 919-541-4975

On-Site Well Water

The facility has an on-site well that is used to supply untreated ground water for ecosystem studies. The well water is not metered. The well water is allowed to flow on a continuous basis in the fish preparation area to keep a fresh supply of ground water readily available for ecosystem studies. An instantaneous measurement of the well water flow conducted in March 2006 indicated the well water flows continuously at about 2 gallons per minute (gpm). Well water is discharged to the sewer system.

5.0 FACILITY INFORMATION

The laboratory building at SESD contains a mixed use of laboratory and office space. The laboratory space is configured to conduct bench-scale analysis of environmental samples and research on chemicals and other environmental stressors. Water is used for mechanical systems, sanitary needs, laboratory processes, and irrigation. Additional details on facility water use are provided in the following sections.

Major Water Using Processes

Estimates of potable water consumption by major use area are provided in Table 1. These data reflect average facility water use between January 2005 and December 2005.

Measurement Devices

Incoming water is supplied by Athens-Clarke County Water through two metered service lines, one for irrigation water (meter number 47152312) and one for all other building uses (meter number 70010229).

The cooling tower is equipped with a meter on the make-up water line. Under this plan, flow data from these meters will be recorded and tracked on a monthly basis. The Facilities Manager and Building Engineer will use these data to monitor trends in water consumption. Unusual or unexpected changes in water consumption will be investigated and resolved.

Shut-off Valves

Shut-off valves for the main building supply and irrigation supply are located in the underground meter pits located in the lawn area near the entry guardhouse.

Table 1. Major Water Using Processes

Major Process	Annual Consumption (gallons)	Percent of Potable Water Total	Comments
Irrigation	Unknown	Not included, flow data not available	Meter was not operational in 2005. Meter was replaced in February 2006
Cooling tower make-up	1,800,000	27.3	Engineering estimate
Stuck discharge valve, DI system	3,100,000	47.0	Engineering estimate
Sanitary water	560,000	8.5	Engineering estimate
RO system, product water	52,000	0.8	Engineering estimate
RO system, reject water	41,000	0.6	Engineering estimate
Miscellaneous laboratory water use	1,043,323	15.8	Calculated by difference
TOTAL	6,596,323	100.0	Average annual usage, January 2005 to December 2005. Does not include irrigation water use, which was not metered in 2005.
Well water supplied to fish preparation area	1,000,000	Not included in potable water total	Estimated from instantaneous measured flow rate

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

Occupancy and Operating Schedules

Approximately 150 people work at the SESD facility. The facility operates on a flex time schedule and are typically occupied between 7:00 a.m. and 6:00 p.m., Monday through Friday.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

FEMP has identified Water Efficiency Improvement Best Management Practices (BMPs) in 10 possible areas. Implementation of BMPs in four or more areas is required under FEMP guidance. Athens SEDS has adopted and will maintain BMPs in five of the 10 areas, as checked below:

- ✓ Public Information and Education Programs
- ☐ Distribution System Audits, Leak Detection, and Repair
- ☐ Water-Efficient Landscape
- ✓ Toilets and Urinals
- ☐ Faucets and Showerheads
- ✓ Boiler/Steam Systems
- ✓ Single-Pass Cooling Systems
- ✓ Cooling Tower Systems
- ☐ Miscellaneous High Water-Using Processes
- ☐ Water Reuse and Recycling

Additional information related to each BMP area is provided in the following sections.

Public Information and Education Programs (BMP #1)

SESD promotes water conservation and awareness using the poster displays in the employee restrooms reminding employees of the importance of water conservation under the EMS. In addition, employees have been educated on water and other resource conservation topics through the implementation of the laboratory EMS. Representatives from every branch participate in the EMS Team; reduction of water consumption is one objectives identified under the EMS. In addition, the EMS Team provides periodic briefings of all employees to remind them of the EMS objectives.

Distribution System Audits, Leak Detection, and Repair

A flow control valve on the de-ionized (DI) system was stuck in open position and leaking approximately 5 to 6 gallons of water per minute. While this leaking valve was corrected in March 2006, the flow data for 2005 suggests that a significant quantity of water was related to this situation.

Facility staff are trained to report leaks and malfunctioning water-using equipment to the Facilities Manager. Reported maintenance problems are assigned a work order, which is completed promptly by the operations and maintenance (O&M) staff under the supervision of the Building Engineer. The Building Engineer, employed by the building owner, reports to the Facilities Manager when each work order has been completed. In addition, the Building Engineer performs a visual inspection of core building and mechanical spaces each morning. Any leaks or other mechanical problems are corrected promptly. Janitors and security guards also are trained to report any observed problems to the Facilities Manager or Building Engineer.

Under this plan, the Facilities Manager and Building Engineer will monitor trends in monthly water use and changes that are not understood or expected will be investigated and resolved.

The facility is currently experiencing a suspected leak in the chilled water loop, based on losses of chemical additives to that system. The Building Engineer is currently evaluating the potential source of the leak, but the cause has not yet been identified. BMP credit is not claimed in this area at this time, pending sustained building operation without suspected water leaks.

Water-Efficient Landscape

Approximately two acres of the 12-acre SESD site are developed, and one of the two developed acres is irrigated. The irrigated area is divided into nine zones, and primarily planted with grasses and shrubs, with some flower beds immediately adjacent to the main entrance. Each zone is irrigated for about 15 minutes, every other day, between 12 midnight and 2 a.m. The irrigation schedule has been established by the landscape contractor, and is controlled with an automated irrigation timer.

Irrigation water use is separately metered. However, the meter was malfunctioning and replaced in February 2006; therefore, no irrigation water use information is available for 2005.

BMP credit is not claimed in this area at this time. For BMP credit, the irrigation controller should be equipped with a weather-based controller or soil moisture sensor to prevent irrigation when there is sufficient natural moisture available for healthy turf growth. Irrigation water use should be carefully monitored so that the minimum quantity necessary for healthy turf growth is applied.

Toilets and Urinals (BMP #2)

Toilets and urinals throughout the SESD facility are all 1992 Energy Policy Act (EPAct) compliant and flush at efficient flow rates (1.6 gallons per flush for toilets and 1.0 gallons per flush for urinals). An inventory of sanitary fixtures is provided in Table 2. Flush valves on the urinals are controlled with automatic sensors.

Table 2. Region 4 SESD, Inventory of Sanitary Fixtures

Fixture Type	Estimated Flow Rate	Total Number
Toilets	1.6 gpf	18
Urinals	1.0 gpf	6
Lavatory faucets	2.5 gpm	18
Showers	2.5 gpm	4

gpf – gallons per flush

gpm – gallons per minute

Janitorial staff and employees are trained to report leaks or other maintenance problems to the Facilities Manager or Building Engineer, which are immediately corrected.

Faucets and Showerheads

Showerheads meet EPAAct requirements (2.5 gallons per minute). However, faucets are equipped with 2.5 gpm flow control aerators and the current EPAAct standards call for a maximum flow rate of 2.2 gpm. An inventory of sanitary fixtures is provided in Table 2.

Water pressure is maintained at approximately 60 pounds per square inch, within the range needed for optimum system performance.

Janitorial staff and employees are trained to report leaks or other maintenance problems to the Facilities Manager or Building Engineer, which are immediately corrected.

BPM credit is not claimed in this area, pending replacement of the faucet aerators with water-efficient fittings.

Boiler/Steam Systems (BMP #4)

The building is equipped with two 130 horsepower low-pressure steam boilers to supply steam for building heating. Steam condensate is captured and reused. The steam boiler system is monitored and maintained on a monthly basis under a service contract to prevent system corrosion and optimize condensate reuse. Boiler water quality parameters such as conductivity, hardness, alkalinity, chloride, and sulfite are monitored and controlled through periodic testing and chemical treatment provided by the service contractor.

Single-Pass Cooling (BMP #5)

The facility has implemented an initiative to eliminate the use of single-pass cooling water. All laboratory equipment cooling needs are now supplied by point of use, air-cooled chiller units.

Cooling Tower Systems (BMP #6)

The laboratory is equipped with a two cell cooling tower, rated at 780 tons of total cooling capacity. A cooling tower maintenance contractor performs a monthly quality, performance, and water chemistry review of cooling tower operation. Chemical treatment is provided to control scale and corrosion. The cooling tower is equipped with a conductivity monitor and automatic blowdown control system. The conductivity meter is set at 850 $\mu\text{S}/\text{cm}$. This set point will result in efficient water use, providing for approximately 9 cycles of concentration. The cooling tower is equipped with a make-up water flow meter. The meter reading will be recorded monthly and trends in cooling tower water use will be monitored by the Building Engineer and Facilities Manager under this plan.

Miscellaneous High Water-Using Processes

The facility is equipped with two Castle M/C 3500 steam sterilizers. The sterilizers are used infrequently and tempering water is not applied when it is not needed. The facility is also equipped with three Heinicke Model H 4000 E glassware washers.

De-ionized water for laboratory use is generated in a centralized system. The DI system consists of a multi-step process consisting of cartridge filtration, carbon adsorption, and reverse osmosis (RO). Product water from the RO unit is used as feed water to the DI recirculating water loop. The DI water is circulated from a holding tank through an ion exchange bed and ultraviolet disinfection unit out to the laboratories through a header system. The circulated water that goes unused is returned to the holding tank. The RO unit rejects 3.0 gallons for water for every 3.8 gallons of product water. Available information suggests a stuck bypass valve on the DI unit may have resulted in the discharge of approximately 5 gallons per minute of water for an extended period in 2005. The valve was corrected in March 2006.

Approximately 2 gallons per minute of well water is supplied to the fish preparation area to support bacteria and worm studies. Much of the time, the water is discharged directly to the sewer drain, but flows at a constant rate to provide a fresh supply of water for culturing organisms.

No specific BMP credit is claimed in this area at this time.

Water Reuse and Recycling

No BMP credit is claimed in this area.

7.0 DROUGHT CONTINGENCY PLAN

Under non-drought conditions, SESD will comply with “pre-drought” water use restrictions mandated by the Georgia Department of Natural Resources (DNR) in Rules for Outdoor Water Use (Chapter 391-3-30-.03). For facilities with even-numbered addresses (e.g., 980 College Station Road), outdoor water use is permitted on Mondays, Wednesdays, and Saturdays.

In the event of a drought, SESD will make all reasonable efforts to follow water use restrictions described in the Georgia Drought Management Plan (Section 4) and Rules for Outdoor Water Use (Chapter 391-3-30-.03) according to the following levels, as declared by DNR’s Environmental Protection Division:

- Drought Response Level One
 - Outdoor water use follows “pre-drought” address scheduling.
 - Outdoor water use is allowed only between 4 p.m. and 10 a.m.
 - Use of fire hydrants for purposes other than firefighting, public health, safety, or flushing is prohibited.
- Drought Response Level Two
 - Outdoor water use follows “pre-drought” address scheduling.
 - Outdoor water use is allowed only between 12 midnight and 10 a.m.
 - Use of fire hydrants for purposes other than firefighting, public health, safety, or flushing is prohibited.
 - Washing hard surfaces (such as streets, gutters, sidewalks, and driveways) is only permitted when necessary for public health and safety.

- Drought Response Level Three
 - Even-numbered addresses: outdoor water use only permitted on Saturdays.
 - Odd-numbered addresses: outdoor water use only permitted on Sundays.
 - Outdoor water use is allowed only between 12 midnight and 10 a.m.
 - The following uses are prohibited (except when necessary for public health and safety):
 - Using fire hydrants.
 - Washing hard surfaces, such as gutters, sidewalks, and driveways.
 - Filling installed swimming pools.
 - Washing vehicles, such as cars, boats, trailers, and motorcycles.
 - Washing buildings or structures.
 - Using water for non-commercial fundraisers, such as car washes.
 - Using water for ornamental purposes, such as fountains, reflecting pools, and waterfalls.
- Drought Response Level Four
 - No outdoor water use is permitted except for activities exempted by EPD in 391-3-30-.05 or by the Environmental Protection Division Director.

Regional drought conditions and general information on water supply management can be found at the “Drought in Georgia” Web site provided by the University of Georgia College of Agriculture and Environmental Sciences:

<http://www.georgiadrought.org/>

SESD will also follow applicable local water use restrictions mandated by Athens-Clarke County that extend beyond state-imposed water use restrictions. Information on Athens-Clarke County water use restrictions are found on the Athens-Clarke County Public Utilities Web site:

<http://www.athensclarkecounty.com/publicutilities/>

8.0 COMPREHENSIVE PLANNING

The Facilities Manager will ensure that water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption.

9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

Region 4 SESD is implementing or considering the following projects to achieve additional reductions in water use:

- 1) **Monitor Water Use Monthly and Evaluate Trends.** Existing supply meters for the main laboratory building and the irrigation system, and the cooling tower make-up water meter will be monitored on a monthly basis by the Facilities Manager and Building Engineer to track trends in water use. Unexpected changes in water use will be investigated and resolved.

- 2) **Evaluate Continuous Flow of Well Water to Fish Preparation Area.** Approximately 2 gallons per minute of well water is continuously supplied to the fish preparation area. SESD will evaluate if this flow rate can be reduced, and still supply well water of sufficient quality for its intended use. While the SESD laboratory is not billed for this water use, the well water is discharged to sewer and if the flow can be reduced it will decrease the treatment demand on the local sewer utility.
- 3) **Upgrade Irrigation System.** Irrigation water use will be carefully monitored so that the minimum quantity necessary for healthy turf growth is applied. A weather-based controller or soil moisture sensor will be installed on the irrigation control system so the irrigation system will not operate when existing moisture levels are adequate. Such sensors typically reduce water use by 15 to 20 percent. Potential savings cannot be estimated at this time, pending collection of irrigation water use data from the recently installed irrigation water meter. In addition, or as an alternative project, the laboratory could consider using on-site well water as supply water for the irrigation system. While this change would not reduce overall water use, it would decrease demand on the county potable water supply.
- 4) **Evaluate Air Handler Condensate Recovery System.** SESD will evaluate the feasibility of installing an air handler condensate recovery system. Several factors indicate conditions are favorable for such a system. Two side-by-side roof mounted air handlers provide laboratory air, so the capture system could be implemented without extensive runs of plumbing. In addition, the facility is located in a warm, humid climate where significant quantities of cold, clean condensate are generated when cooling loads are the greatest. Recovered condensate could be reused as cooling tower make-up water. A detailed study would be required to estimate the cost of installation. (A similarly sized system installed at EPA's Houston laboratory cost approximately \$6,000 in 1999 and has recovered over 1,000,000 gallons of water per year).
- 5) **Evaluate Replacing Faucet Aerators.** Lavatory faucets may be equipped with high-efficiency aerators that limit flow to 1.0 or 0.5 gpm for a few dollars each. If feasible with the existing faucet configuration, replacing faucet aerators would save an estimated 50,000 gallons and \$250 per year, and provide payback in less than 1 year.

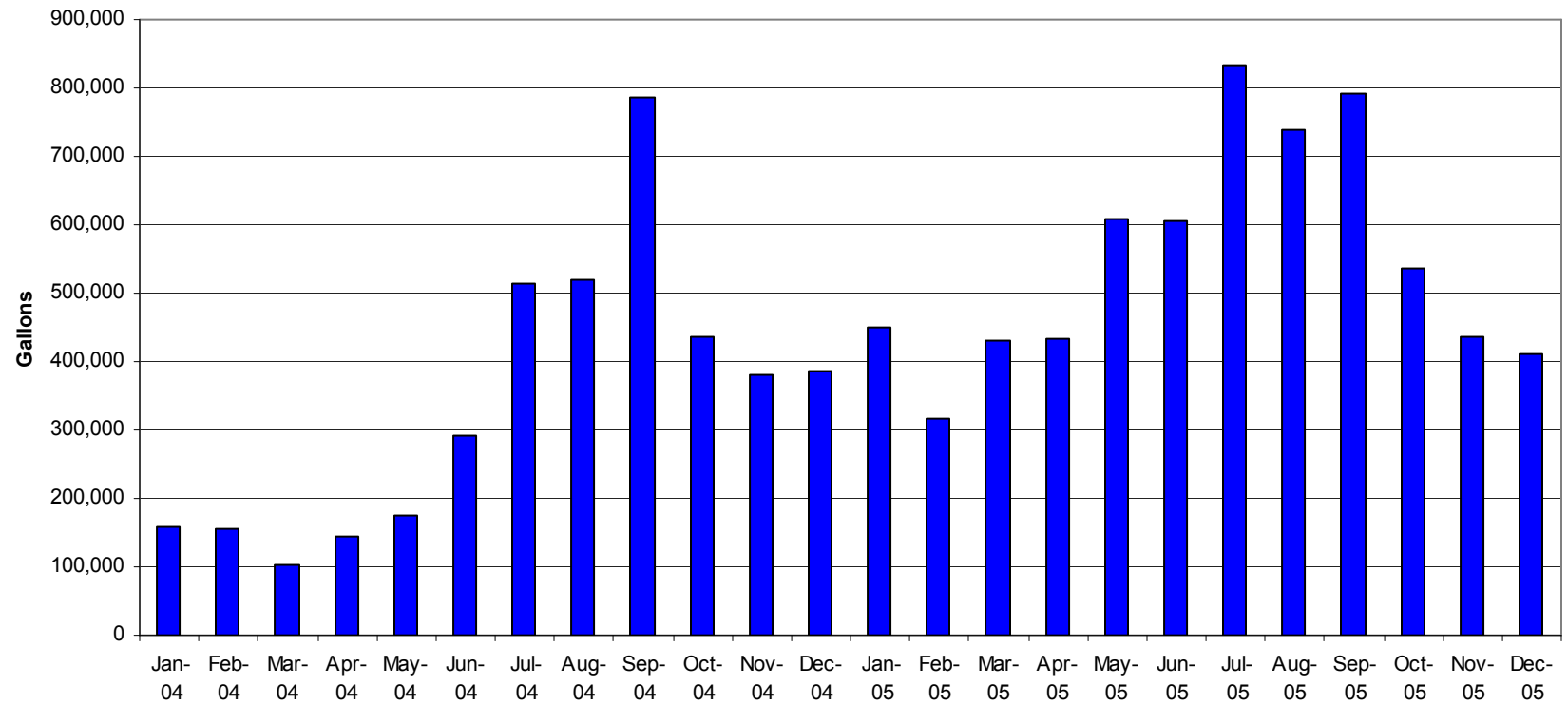
Appendix A

WATER USE AND WATER BALANCE SUPPORTING CALCULATIONS

Region 4 Science and Ecosystem Support Division
Water Balance Supporting Calculations
Based on Water use Data from 2005

Major Process	Annual Consumption (gallons)	Supporting Calculations
Potable Water Consumption		
Irrigation	Unknown	Unknown because of meter malfunction. Meter was not operational in 2005. Meter was replaced in February 2006
Cooling tower make-up	1,800,000	Engineering estimate based on seasonal use patterns. Assume baseline water use, with minimal influence from tower use, occurred between January and April 2005. This use is approximately 400,000 gallons per month or 4,800,000 gallons per year. Total water use in 2005 was 6,596,323 gallons, minus the baseline use of 4,800,000 gives 1,796,323 by difference
Stuck discharge valve, DI system	3,100,000	Engineering estimate. The discharge valve on the DI System was stuck in the open position during a water use review in March 2006. The stuck valve was discharging approximately 5 gpm. Facility water use trend data suggest this may have been the case dating back to mid-2004. Assume baseline water use, with minimal influence from the DI discharge and tower use, occurred between January and April 2004. This use is 140,447 gal/month or 1,685,364 gallons per year. Water use from the stuck DI valve is calculated by difference. Total use 6,596,323, minus cooling tower use, 1,800,000, minus baseline use, 1,685,364 = 3,110,959 gallons
Sanitary water	560,000	Engineering estimate based on 150 people using 15 gallons/day, 250 days per year. $150 * 15 * 250 = 562,500$ gallons
RO system, product water	52,000	Engineering estimate based on approximately 2, 500-gallon tank volumes used per week. $2 * 500 \text{ gallons/week} * 52 \text{ weeks} = 52,000$ gallons
RO system, reject water	41,000	Based on the design ratio of RO system reject to product water, applied to the estimated product water total. $3.0/3.8 * 52,000 = 41,052$ gallons
Miscellaneous laboratory water use	1,043,323	Calculated by difference from the main laboratory meter. $6,596,323 - 1,800,000 - 3,100,000 - 560,000 - 52,000 - 41,000 = 1,043,323$ gallons
TOTAL	6,596,323	Average annual usage, January 2005 to December 2005. Does not include irrigation water use, which was not metered in 2005
Well Water Consumption		
Well water supplied to fish preparation area	1,000,000	Estimated based on instantaneous measured flow rate. 2 gallons/minute * 60 minutes/hour * 24 hours per day * 365 days per year = 1,051,200 gallons

Monthly Water Use at Athens-SES Lab (CY2004-CY2005)



**Water Use at the Athens-SESD Laboratory
CY 2004 to CY 2005**

Month-Year	Water Consumption (CF)	Water Consumption (Gal)
Jan-04	21,300	159,335
Feb-04	20,850	155,969
Mar-04	13,650	102,109
Apr-04	19,300	144,374
May-04	23,300	174,296
Jun-04	38,850	290,618
Jul-04	68,800	514,660
Aug-04	69,500	519,896
Sep-04	105,050	785,829
Oct-04	58,350	436,488
Nov-04	51,050	381,881
Dec-04	51,450	384,873
Jan-05	60,100	449,579
Feb-05	42,500	317,922
Mar-05	57,650	431,252
Apr-05	57,800	432,374
May-05	81,500	609,662
Jun-05	81,100	606,670
Jul-05	111,350	832,956
Aug-05	98,900	739,823
Sep-05	105,650	790,317
Oct-05	71,800	537,101
Nov-05	58,450	437,236
Dec-05	55,000	411,429
TOTAL	1,423,250	10,646,650